

## Composite light weight building panel and core material therefor

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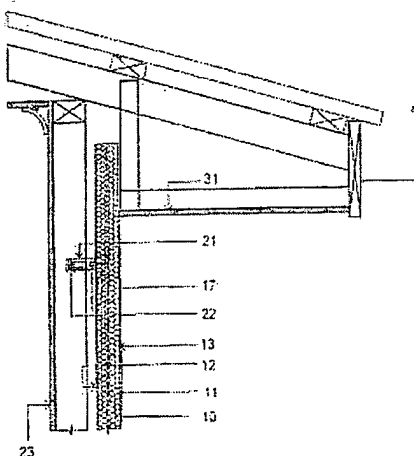
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### Abstract of NZ 524520 (A)

A core material for a composite light weight building panel formed from a settable mixture that incorporates an acrylic, polymer-based resin, cement, water and a light weight filler material in the following ratios: from 1 to 3 litres of cement; more than 2 litres of resin; from 10 to 100 litres of light weight filler material; and less than 6 kilograms of water, such that the volume of cement is more than half the volume of resin. The resin comprises: 85 % by volume water based copolymer emulsion of polyvinyl acetate with versatate and/or acrylic copolymers in a water emulsion; 10 % water soluble colloid protector; 5 % additives; such that the resin obtains a specific gravity in the range of 1000 +/- 50g/l and an 8 Ford viscosity at 20 DEG C of 7 +/- 1.



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Patent 524520

A core material for a composite light weight building panel formed from a settable mixture that incorporates an acrylic, polymer-based resin, cement, water and a light weight filler material in the following ratios: from 1 to 3 litres of cement; more than 2 litres of resin; from 10 to 100 litres of light weight filler material; and less than 6 kilograms of water, such that the volume of cement is more than half the volume of resin. The resin comprises: 85 % by volume water based copolymer emulsion of polyvinyl acetate with versatate and/or acrylic copolymers in a water emulsion; 10 % water soluble colloid protector; 5 % additives; such that the resin obtains a specific gravity in the range of 1000  $\pm$  50g/l and an 8 Ford viscosity at 20 DEG C of 7  $\pm$  1.

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COMPOSITE LIGHT WEIGHT BUILDING PANEL AND CORE MATERIALTHEREFORTECHNICAL FIELD OF THE INVENTION

THIS INVENTION relates to a composite light weight building  
5 panel and a core material therefor.

BACKGROUND ART

The invention has been developed primarily for use in the  
construction of dwelling houses and will be described with  
reference to this application. However, it will be appreciated  
10 that the invention is not limited to this particular field of use  
and may be used, for example, in the construction of other  
buildings.

The core used for light weight panels is often made from  
foamed plastics material, such as polystyrene foam, and  
15 frequently includes suitable fire retardant additives. However,  
such foamed plastics materials are expensive and of limited  
strength, and often rely upon cladding or a coating to impart  
strength to the panel. Sometimes composite panels have a metal  
cladding which increases their cost. Metal clad panels may also  
20 be difficult to cut to size, especially on a house constructions  
site.

The present invention aims to ameliorate one or more of the  
above problems or at least provide an alternative composite wall  
panel and a core material therefor for use in building  
25 construction. Other aims and advantages may become apparent from  
the following description.

DISCLOSURE OF THE INVENTION

With the foregoing in view, the present invention resides  
broadly, according to one aspect thereof, in a core material for  
30 a composite light weight building panel formed from a settable  
mixture, said mixture including an acrylic, polymer-based resin  
comprising:

85% by volume water based copolymer emulsion of polyvinyl  
acetate with versatate and/or acrylic copolymers in a water  
35 emulsion;

10% water soluble colloid protector;

5% additives;

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such that the resin obtains a specific gravity in the range of  $1000 \pm 50$  g/l and an 8 Ford viscosity at  $20^{\circ}\text{C}$  of  $7 \pm 1$ ; and the mixture having the following ratios:

- from 1 to 3 litres of cement;
- 5 more than 2 litres of resin;
- from 10 to 100 litres of light weight filler material;
- less than 6 kilograms of water, and
- such that the volume of cement is more than half the volume of resin.

- 10 Suitably, the additives include glycols, mildew agents, foam suppressant, colouring agents, setting agents, wetting agents and/or dispersants, and preferably the copolymer emulsion comprises (dry) approximately 70% polyvinyl acetate, approximately 29% vinyl versatate and 1% acrylic acid. One
- 15 preferred copolymer emulsion comprises (dry) 69.3% polyvinyl acetate, 29.7% vinyl versatate and 1% acrylic acid, the polymers comprising 45.5 % of the emulsion, the balance being water. It will be appreciated by the addressee skilled in the art of aqueous polymer emulsions that the copolymer emulsion and its
- 20 additives may be varied in its composition whilst providing a polymer-based resin which will set in normal atmospheric conditions.

- Preferably, the acrylic, polymer-based resin is of the type identified by the trade mark "JOLLY FIX" as the product of
- 25 Colorificio A. & B. Casati S.p.A of Verona, Italy, having their Product Code 109001, and having as one of its components 2-methyl-2,4-pentanediol. This product is an acrylic, polymer-based liquid resin (or powdered form if desired) currently sold in 16 litre containers, designed for use as a masonry sealer, the
  - 30 normal instructions being to dilute the product with water and then paint it over the masonry for sealing purposes. Its use in the present invention, with unexpected results, and in novel proportions, meets a longstanding demand for products of this type having desirable characteristics.

- 35 In another aspect, the invention resides broadly in a core material for a composite light weight building panel formed from

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a settable mixture, said mixture including an acrylic, polymer-based resin as hereinbefore described and having the ratios:

- from 1 to 1½ litres of cement;
- from 2 to 4 litres of resin;
- 5 from 60 to 100 litres of light weight filler material;
- less than 2 kilograms of water.

Preferably, the consistency of the mixture is paste-like, and may be thixotropic such that the mixture may be formed into the shape of a panel core with the aid of vibration. It is also  
10 preferred that the panel core is substantially planar having two opposite spaced apart faces. In such form, it is further preferred that the core material includes a backing sheet, such as fibro cement, plywood, or paper.

- In a preferred form, the mixture has the following ratios:
- 15 6 litres of resin;
  - 4 litres of water;
  - 8 litres of cement, and
  - from 60 to 100 litres of light weight filler material.

Preferably, the light weight filler material is in the form  
20 of polystyrene foam beads of approximately 3 mm diameter. However, other filler materials have been found to provide alternatives, including minerals, such as perlite, vermiculite, or similar minerals, paper comminuted to short or long strips, or sawdust. The ratios of solids materials (cement and light  
25 weight filler material) and liquid materials (water and resin) are selected to produce a core forming composition of paste-like consistency when mixed together, and which may be formed into a desired shape, particularly, a planar panel-like shape, and allowed to set to form a core panel.

30 If additional strength is required, up to 40 g short strand fibreglass may be added to the mixture. Additionally, fibreglass textile sheet may be included within the core panel, approximately medially between the two faces, the fibreglass being added to the core panel in accordance with a method  
35 according to the invention described hereinafter.

In a further preferred form, the core panel is coated with a coating composition comprised in a mixture of sand or

equivalent material, standard quality cement, water, and an acrylic, polymer-based resin as hereinbefore described, the mixture having the following ratios:

for every kilogram of sand:

5 more than 20 volume per cent (vol%) cement; less than 12 vol% water; and more than 20 vol% resin;

such that the ratio of resin to water is more than four to one, and the ratio of resin to cement is less than two to one.

The coating composition may be formulated without the water, 10 but it is preferred that the water is more than 4 vol% of the sand.

In one example, the coating composition has the aforementioned ingredients are used in the proportions by volume of 5 litres of resin; 4 litres of cement, 20 kg (12 litres) of 15 sand and 400 ml of water. However, in other Examples, the material formulation by volume ranges within the following:

Resin: 5 litres (plus 300% down to less 70%)

Cement: 4 litres (plus 100% down to less 70%)

Sand: 12 litres (plus 100% down to less 50%)

20 and

Water: 300-500 ml (plus or minus 100%), all depending on the temperature as described.

In such form, the cement may be omitted altogether. The 25 ingredients for the coating may be mixed in any suitable container, such as of metal or plastics material, the easiest procedure being to place the resin and water in the container and cause these to be mixed by stirring steadily, adding the cement and sand progressively, such as in a standard concrete mixer. 30 However, provided thorough mixing is ensured, all ingredients could be added simultaneously to the container. The mixed product should be used without being stored since it contains a cement component and will set in a reasonably short period of time, such as 12 hours when in mixed bulk form. However, if a 35 film of water is placed over the product in a container, it may be stored overnight for example, being able to be re-mixed manually and used without loss of efficiency.

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The mixed product can be applied to the panels of the present invention at a building site after the moulding has been fixed in place. It will thus be apparent that the coating composition can be used also as a patching compound, covering marks left by penetrable fasteners when such procedures are called for, and also usable for repair purposes in the event of damage to a moulding or the unlikely event of delamination occurring. The coating composition may be used as a filler if repairs are needed to existing mouldings, even if such existing mouldings were manufactured in accordance with the prior art.

The cement used may be any type of standard quality cement, but it has been found that standard Portland cement, ivory or white, is effective. The sand used is preferably beach sand which is quite fine, but any sand-like substitute could be used, provided it has a generally comparable grain size. It will be apparent that the key component is the resin product as hereinbefore described.

The coating composition may be applied to a panel of the present invention by manual spraying, mechanical spraying, or the panels may be immersed into the coating composition. The coating composition could be trowelled on, or brushed on or sponged on. Preferably there is used a manual spray action employing a hand-held, standard domestic or industrial hopper gun, spraying being arranged at various degrees and angles depending upon the size and shape of the moulding. This can be achieved by forward and backward movement alternately in the longitudinal direction of the panel or by circular rotation progressively in a spiral or equivalent circular-type motion until the desired thickness of coating has been attained. An operator may incorporate air-flow pressure and hand-trigger adjustment of the hopper gun to create the desired steady flow and ensure evenness of coating to the polystyrene, the pressure in the compressor for spraying purposes being about  $2.8 \pm 1.4$  MPa ( $400 \pm 200$  psi).

Because the coating composition is light in weight yet strong in durability, the coating thickness can be as small as 0.05 mm, but the preferred thickness is 1 mm to 2 mm, and sometimes up to 10 mm or more where filling is required,

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preferably applied in successive operations spaced in time. While the coatings are light in weight, they give a solid, more cement-like appearance in the final product. There can be a price saving to the consumer since less material is applied for comparable results, while there is the major advantage that delamination should not occur with these compositions. Most importantly, no primer will be required for adequate adhesion and the resultant product will be found to offer good water-resistance characteristics. The coating composition may also be formulated without sand.

In an alternative preferred form, the other face is coated with an alternative coating composition comprising (by volume):

a primary portion of adhesive material formed from ethylene vinyl acetate copolymer diluted with 0% to 21% acrylic paint and 0% to 8% water, and

a secondary portion of textile material at least partially embedded in the primary portion.

Preferably, the textile material is substantially completely embedded in the adhesive material, and more preferably, such that the textile material is completely wetted or saturated by the adhesive material. It is preferred that the textile material be a fibreglass textile material ranging from a fibreglass tissue having a gram weight specification of 40/300 g/m<sup>2</sup> to a fibreglass mesh having a gram weight specification of 50/400 g/m<sup>2</sup>.

Other coatings may be provided, such as render, followed by a finishing coating, such as paint, granosite, or such like.

In another aspect, the present invention resides broadly in a building panel having a backing sheet and a core formed from a core material as hereinbefore described bonded to the backing sheet, the core having a coatable face remote from the backing sheet, and a coating applied to the coatable face for weatherproofing the panel.

Preferably, the coatable face is formed with a rough surface to permit the coating to be keyed in. For example, a render coating for weatherproofing is preferably applied in such manner that the render material penetrates at least partially into the coatable face.



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In another aspect, the present invention resides broadly in a method of forming a core for a light weight composite building panel, said method including the steps of:

providing a quantity of water and resin in a ratio as  
5 hereinbefore described, and mixing the water and resin together;

adding thereto and mixing in a quantity of cement in a ratio  
as hereinbefore described to the water and resin to produce a  
slurry;

adding thereto and mixing in a quantity of light weight  
10 filler material in a ratio as hereinbefore described to produce  
a core forming composition;

forming the core forming composition into a panel shape, and  
leaving the panel shaped core forming composition for a time  
sufficient to set into a core forming panel.

15 Preferably, the mixture is applied to a backing board of  
fibre-cement, plywood, polystyrene sheet or such like to an  
overall panel thickness of from 30 mm to 100 mm. The panels are  
preferably of an industry standard size, such as 2.45 metres by  
600 mm or 800 mm. The method may incorporate the step of adding  
20 a layer of fibreglass textile to a first layer of the mixture  
prior to setting thereof, and adding a second layer of the  
mixture to the first layer onto the fibreglass textile to embed  
the fibreglass layer between the first and second layers of the  
mixture. If desired, the fibreglass textile may be pressed into  
25 the first layer of the mixture, or wetted with water, resin, or  
a mixture thereof, or pre-soaked with the mixture without the  
light weight filler material, to decrease the likelihood of air  
being entrapped in the fibreglass textile.

The method may then include the steps of coating the core  
30 with one or more of the coating compositions as hereinbefore  
described, and allowing the coating or coatings to set. A  
coating suitable for external use may be provided on one face  
according to the intended use of the finished panel.

The ingredients may be mixed in any suitable container, but  
35 preferably are loaded into a high speed blender. Mixers of the  
type which have a tumbling action are also suitable, such as  
concrete mixers.

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BRIEF DESCRIPTION OF THE DRAWINGS

In order that the invention may be more readily understood and put into practical effect, reference will now be made to the accompanying drawings which illustrate a typical application of  
5 a preferred embodiment of the invention, and in which:

Fig. 1 is a part sectional view of a panel according to the invention as installed in relation to a first type of concrete slab arrangement;

10 Fig. 2 is a part sectional view of a panel according to the invention as installed in relation to a second type of concrete slab arrangement;

Fig. 3 is a part sectional view of a panel according to the invention as installed in relation to a first soffit arrangement;

15 Fig. 4 is a part sectional view of a panel according to the invention as installed in relation to a second soffit arrangement;

20 Fig. 5 is a part sectional view of a panel according to the invention as installed in relation to a flush eave arrangement;

Fig. 6 is a part sectional view of a panel according to the invention as installed in relation to a window sill; and

Fig. 7 is a part sectional view of a panel according to the invention as installed in relation to a window head.

25 DETAILED DESCRIPTION OF THE DRAWINGS

In the drawings, the same reference numerals are used to indicate the same or corresponding parts, though not all such parts are given reference numerals in each drawing. The panel  
10 shown in each of Figs. 1 to 7 is fixed to a stud 21 by a  
30 several fixing brackets shown typically at 22 so that it is spaced therefrom. A wall lining 23 is fixed to the stud (and other parts of a building frame not shown).

The panel has an inner face closer to the the stud and an outer face spaced therefrom, and a reinforcing mesh 11 interposed  
35 between the faces. The inner face has a backing membrane bonded thereto, and the outer face has a render coating applied. The brackets are fixed to a channel 17 embedded in the panel with its

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web against the inner surface and its flanges extending into the body of the panel.

Referring to Fig. 1, the base of the panel rests on a silicone bead provided on the upper face of a footing which supports a concrete slab which rests on in Fig. 2, the base of the panel rests on the upper face of a step on the edge of the concrete slab which itself is supported on a footing. Referring to Fig. 3, the panel extends above the soffit lining 31, but in Fig. 4, the upper edge of the panel abuts against the underside face of the soffit lining. Referring to Fig. 5, a fascia board 32 covers an upper strip of the outer face near the upper edge of the panel.

Referring to Figs. 6 and 7, the edges of the panel closest to the window frames 42 are encased by an edge angle 45 with one flange embedded between the render and the panel core, and the other flange forming the edge of the panel. A bead of sealant 44 is applied to seal the edge of the panel with respect to the window frames.

Although the invention has been described with reference to specific examples, it will be appreciated by those skilled in the art that the invention may be embodied in many other forms which fall within the broad scope and ambit of the invention as defined in the following claims.

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CLAIMS

1. A core material for a composite light weight building panel formed from a settable mixture, said mixture including an  
5 acrylic, polymer-based resin comprising:

85% by volume water based copolymer emulsion of polyvinyl acetate with versatate and/or acrylic copolymers in a water emulsion;

10% water soluble colloid protector;

10 5% additives;

such that the resin obtains a specific gravity in the range of 1000  $\pm$  50 g/l and an 8 Ford viscosity at 20°C of 7  $\pm$  1; and the mixture having the following ratios:

from 1 to 3 litres of cement;

15 more than 2 litres of resin;

from 10 to 100 litres of light weight filler material;

less than 6 kilograms of water, and

such that the volume of cement is more than half the volume of resin.

20

2. A core material according to Claim 1, wherein the additives include glycols, mildew agents, foam suppressant, colouring agents, setting agents, wetting agents and/or dispersants, and preferably the copolymer emulsion comprises (dry) approximately  
25 70% polyvinyl acetate, approximately 29% vinyl versatate and 1% acrylic acid.

3. A core material according to Claim 2, wherein the copolymer emulsion comprises (dry) 69.3% polyvinyl acetate, 29.7% vinyl  
30 versatate and 1% acrylic acid, the polymers comprising 45.5 % of the emulsion, the balance being water.

4. A core material for a composite light weight building panel formed from a settable mixture, said mixture including an  
35 acrylic, polymer-based resin as defined in Claim 1 and having the ratios:

from 1 to 1½ litres of cement;

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CLAIMS

1. A core material for a composite light weight building panel formed from a settable mixture, said mixture including an acrylic, polymer-based resin comprising:

85% by volume water based copolymer emulsion of polyvinyl acetate with versatate and/or acrylic copolymers in a water emulsion;

10% water soluble colloid protector;

5% additives;

such that the resin obtains a specific gravity in the range of  $1000 \pm 50$  g/l and an 8 Ford viscosity at 20°C of  $7 \pm 1$ ; and the mixture having the following ratios:

from 1 to 3 litres of cement;

more than 2 litres of resin;

from 10 to 100 litres of light weight filler material;

less than 6 kilograms of water, and

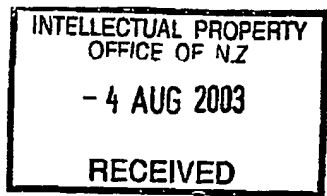
such that the volume of cement is more than half the volume of resin.

2. A core material according to Claim 1, wherein the additives include glycols, mildew agents, foam suppressant, colouring agents, setting agents, wetting agents and/or dispersants, and preferably the copolymer emulsion comprises (dry) approximately 70% polyvinyl acetate, approximately 29% vinyl versatate and 1% acrylic acid.

3. A core material according to Claim 2, wherein the copolymer emulsion comprises (dry) 69.3% polyvinyl acetate, 29.7% vinyl versatate and 1% acrylic acid, the polymers comprising 45.5 % of the emulsion, the balance being water.

4. A core material for a composite light weight building panel formed from a settable mixture, said mixture including an acrylic, polymer-based resin as defined in Claim 1 and having the ratios:

from 1 to 1½ litres of cement;



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from 2 to 4 litres of resin;  
from 60 to 100 litres of light weight filler material;  
less than 2 kilograms of water.

5. A core material according to Claim 4, wherein the consistency of the mixture is paste-like and the panel core is substantially planar having two opposite spaced apart faces.

6. A core material according to Claim 5, wherein the core material includes a backing sheet, selected from fibro cement, plywood, and paper.

7. A core material for a composite light weight building panel formed from a settable mixture, said mixture including an acrylic, polymer-based resin comprising:

85% by volume water based copolymer emulsion of polyvinyl acetate with versatate and/or acrylic copolymers in a water emulsion;

10% water soluble colloid protector;

5% additives;

such that the resin obtains a specific gravity in the range of  $1000 \pm 50$  g/l and an 8 Ford viscosity at 20°C of  $7 \pm 1$ ; and the mixture having the following ratios:

6 litres of resin;

4 litres of water;

8 litres of cement, and

from 60 to 100 litres of a light weight filler material.

8. A core material according to Claim 7, wherein the ratios of solids materials (cement and light weight filler material) and liquid materials (water and resin) are selected to produce a core forming composition of paste-like consistency when mixed together, and which may be formed into a desired shape.

9. A core material according to any one of Claims 5 to 8 and including a fibreglass textile sheet included within the core panel, approximately medially between the two faces.

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10. A composite panel including a core material according to any one of Claims 1 to 9 and having two opposite spaced apart faces.

11. A composite panel according to Claim 10, wherein the core material is coated with a coating composition comprised in a mixture of sand or equivalent material, standard quality cement, water, and an acrylic, polymer-based resin as defined in Claim 1 or Claim 2 or Claim 3, the mixture having the following ratios:

for every kilogram of sand:

more than 20 volume per cent (vol%) cement; less than 12 vol% water; and more than 20 vol% resin;

such that the ratio of resin to water is more than four to one, and the ratio of resin to cement is less than two to one.

12. A composite panel according to Claim 11, wherein the coating composition is formulated without the water.

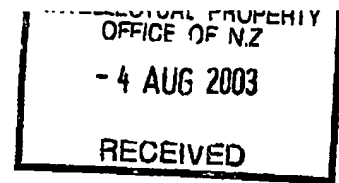
13. A composite panel according to Claim 11, wherein the coating composition is formulated with water to more than 4 vol% of the sand.

14. A composite panel according to any one of Claims 11 to 13, wherein the coating composition has the proportions by volume of 5 litres of resin; 4 litres of cement, 20 kg (12 litres) of sand and 400 ml of water.

15. A composite panel according to Claim 14, wherein the material formulation by volume ranges within the following:

Resin:	5 litres (plus 300% down to less 70%)
Cement:	4 litres (plus 100% down to less 70%)
Sand:	12 litres (plus 100% down to less 50%)
	and
Water:	300-500 ml (plus or minus 100%).

16. A composite panel according to Claim 11, wherein one of the faces is coated with an alternative coating composition comprising (by volume):



a primary portion of adhesive material formed from ethylene vinyl acetate copolymer diluted with 0% to 21% acrylic paint and 0% to 8% water, and

a secondary portion of textile material at least partially embedded in the primary portion.

17. A composite panel according to Claim 16, wherein the textile material is substantially completely embedded in the adhesive material, and such that the textile material is completely wetted or saturated by the adhesive material.

18. A composite panel according to Claim 16 or Claim 17, wherein the textile material is a fibreglass textile material ranging from a fibreglass tissue having a gram weight specification of 40/300 g/m<sup>2</sup> to a fibreglass mesh having a gram weight specification of 50/400 g/m<sup>2</sup>.

19. A building panel having a backing sheet and a core formed from a core material according to any one Claims 1 to 9 bonded to the backing sheet, the core having a coatable face remote from the backing sheet, and a coating applied to the coatable face for weatherproofing the panel.

20. A method of forming a core for a light weight composite building panel, said method including the steps of:

providing a quantity of water and resin in a ratio as hereinbefore described, and mixing the water and resin together;

adding thereto and mixing in a quantity of cement to the water and resin in a ratio as defined in any one of claims 1, 4, 7 or 8 to produce a slurry;

adding thereto and mixing in a quantity of light weight filler material in a ratio as defined in any one of Claims 1, 4, 7 or 8 to produce a core forming composition;

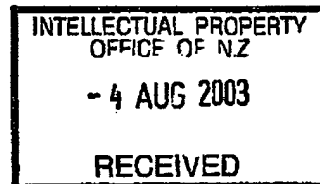
forming the core forming composition into a panel shape, and

leaving the panel shaped core forming composition for a time sufficient to set into a core forming panel.



21. A method according to Claim 20, wherein the core forming composition is applied to a backing board of fibre-cement, plywood, polystyrene sheet or such like to an overall panel thickness of from 30 mm to 100 mm.

22. A method according to Claim 20 or Claim 21, and incorporating the step of adding a layer of fibreglass textile to a first layer of the core forming composition prior to setting thereof, and adding a second layer of the core forming composition to the first layer onto the fibreglass textile to embed the fibreglass layer between the first and second layers of the mixture.



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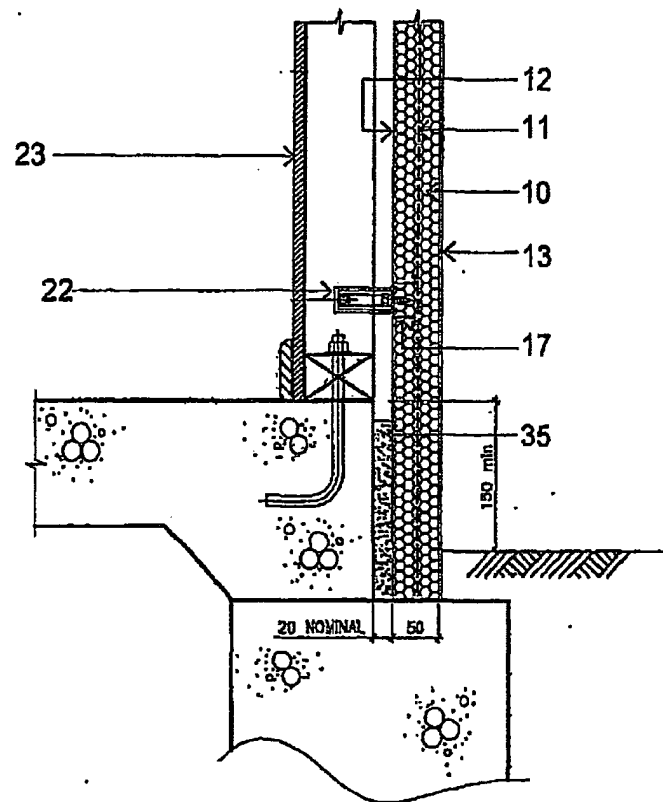


Fig. 1

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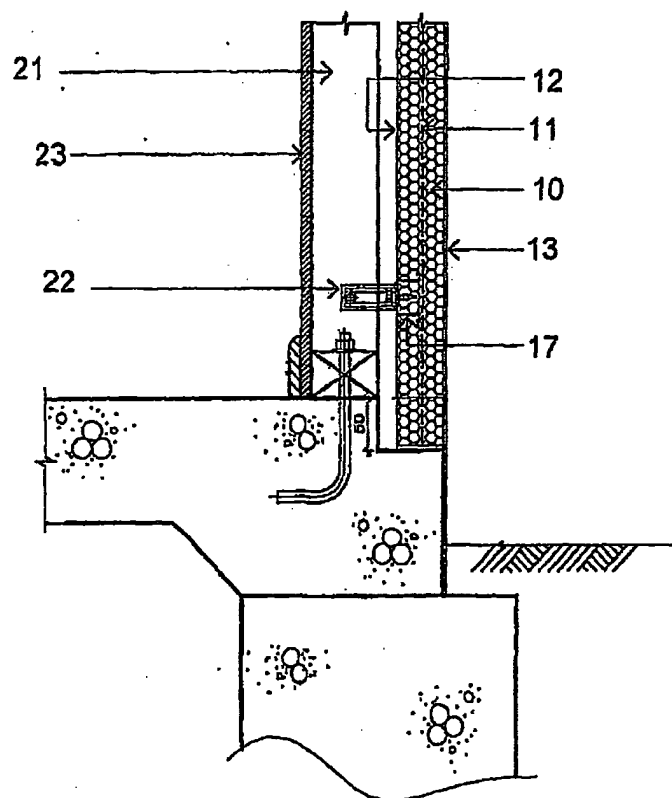


Fig. 2

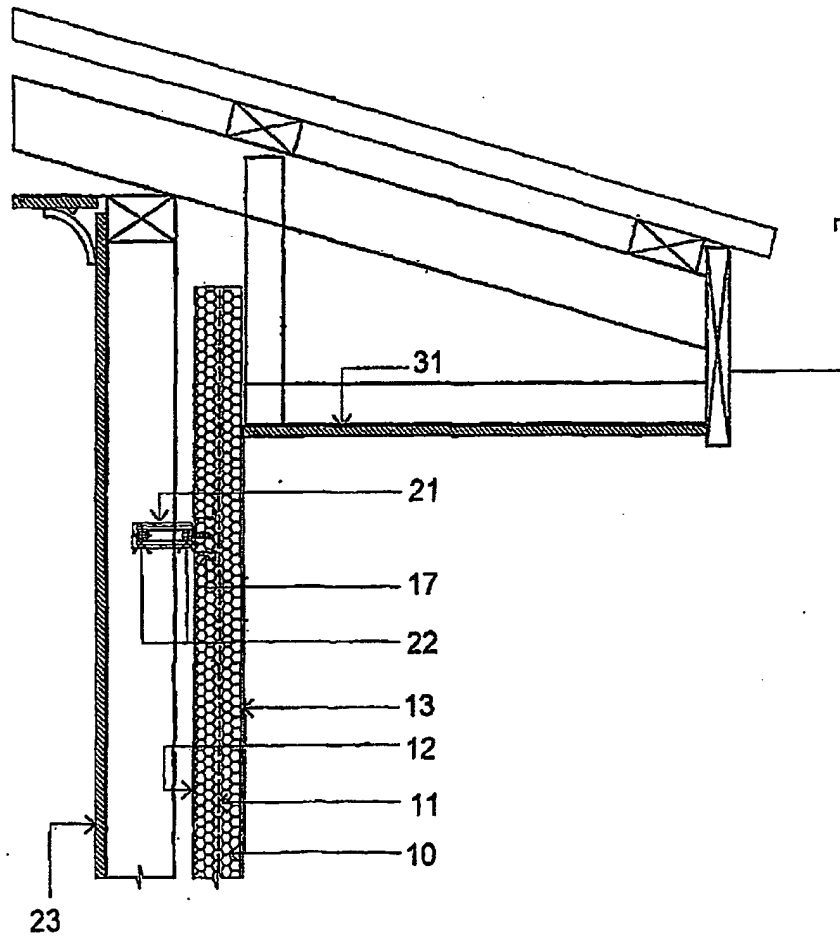


Fig. 3



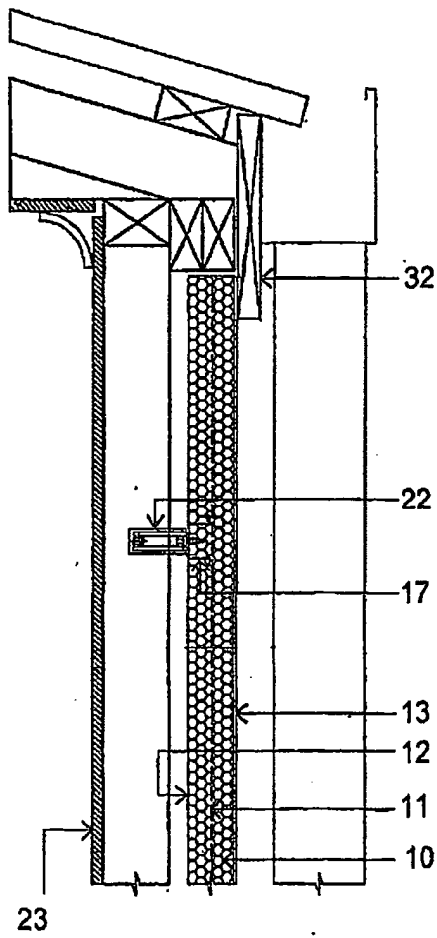


Fig. 5

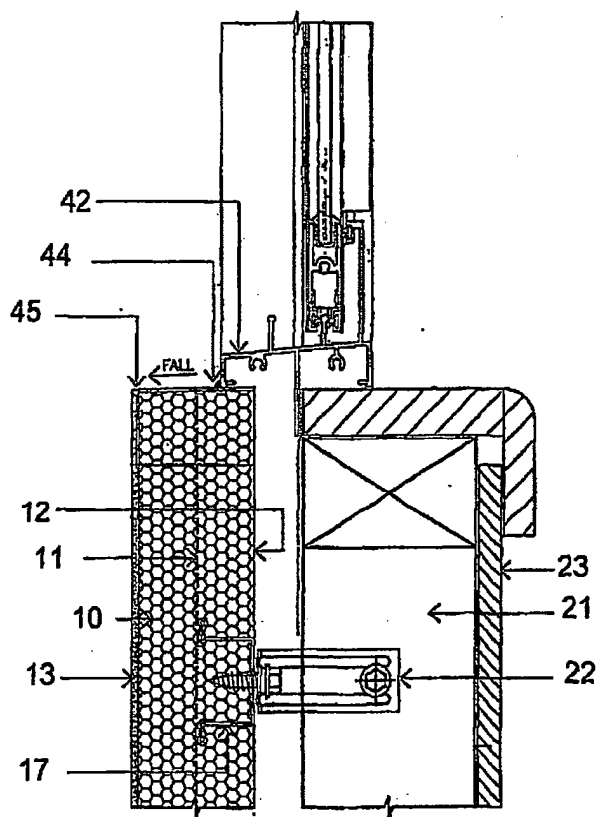


Fig. 6

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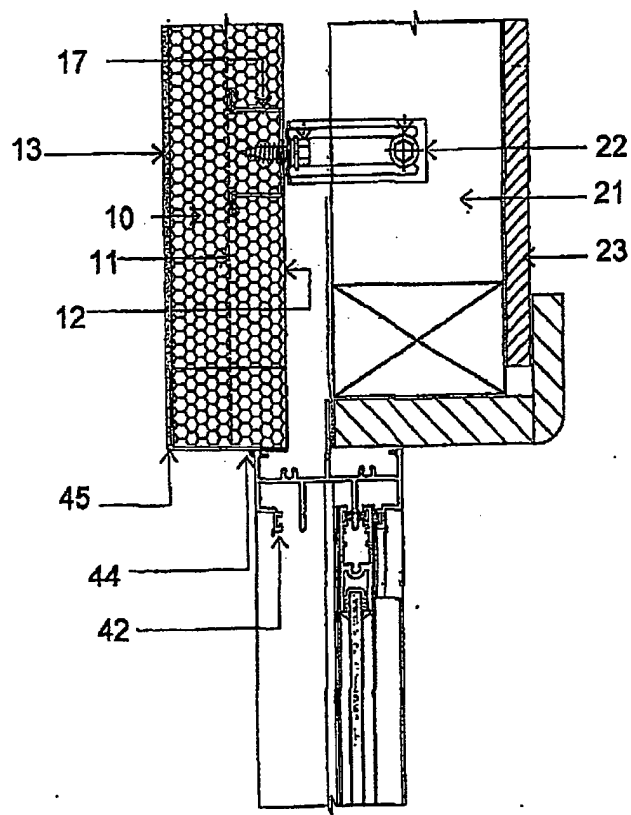


Fig. 7



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